RECENT ADVANCES IN OUR KNOWLEDGE OF THE EVOLUTION OF THE HORSE.

BY HENRY F. OSBORN.

(*Read April 7, 1904.*)

The American Museum explorations for the development of the horse practically began in 1901 with the first expedition to the Rocky Mountain region in that year, conducted by Dr. J. L. Wortman. By continued exploration and the acquisition of the Cope Collection of fossil vertebrates remains of a large number of fossil horses were secured. In 1901, however, explorations were organized with the particular purpose of securing materials for the further study of the evolution of the horse with the fund donated by the late William C. Whitney. Mr. J. W. Gidley, a graduate of Princeton University, was placed in charge of expeditions sent into Texas, Colorado, South Dakota and Nebraska. The remains of 146 horses were secured, making a total of remains representing this animal in the Museum of upwards of 770.

In the year 1900 the chief discovery was a herd of six Pleistocene horses belonging to the new species *Equus scotti*, giving us for the first time a complete knowledge of the osteology of the American Pleistocene horse—a large-headed, short-limbed animal, proportioned somewhat like the zebra. In 1901, the first year of the Whitney expeditions, *Hypohippus* was discovered in the Upper Miocene, a genus named by Joseph Leidy but hitherto little understood; this animal, although contemporaneous with several highly specialized types of horses, was found to represent a forest-living type, with short crowned teeth and persistent lateral toes. In 1902 the remarkable discovery was made of a new genus and species of horse, *Neohipparion whitneyi*, in the Upper Miocene of western Nebraska. This animal, in contrast with the foregoing, was extremely light limbed, proportioned rather like the deer, with diminutive lateral toes, long crowned teeth, and represented a highly specialized, cursorial type, remotely related to the *Hipparion* of Europe.

Our explorations therefore have demonstrated the existence of two and probably three collateral lines of horses contemporaneous with the *Protohippus* line, which apparently led into the true horse. The early conclusions of Joseph Leidy, based on far less

perfect material, are thus confirmed in the most gratifying manner. Many problems yet remain to be solved, however, especially the osteology of the line leading directly into the modern horse. Explorations will therefore be continued, especially the search for the skeleton of *Protohippus*, with a view to ascertaining whether this is or is not one of the direct ancestors of *Equus caballus*.

American Museum of Natural History,
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RADIUM IN AN AMERICAN ORE.

BY ALEXANDER H. PHILLIPS.

(*Read April 8, 1904.*)

The work which I have accomplished in the separation of radium, or more exactly the concentration of radium in barium salts, has been carried on entirely with the mineral carnotite.

Carnotite is comparatively a new mineral, having been described by Friedel and Cumenge in July, 1899, and for this reason it is not found in most books on mineralogy, and is therefore but little known to the general prospector. It was first discovered in the western part of Colorado, and occurs in Montrose, San Miguel and Mesa counties of that State and the adjacent counties of Utah.

The theoretical percentage composition as given by Friedel and Cumenge is:

UO_3	63.54%
V_2O_5	20.12 "
K_2O	10.37 "
H_2O	5.95 "

Results very close to these were obtained in the actual analyses. The mineral formula is given as $2UO_3$, V_2O_5, K_2O, $3H_2O$, or a uranyl potassium vanadate with three molecules of water of crystallization. Hillebrand, after a series of analyses, disputes this composition, and holds that the mineral is probably a mixture to which the above simple formula is not applicable.

Carnotite is a light canary-colored powder disseminated through a fine-grain sandstone. It is easily soluble in acids, and is treated in this way for the commercial production of uranium salts.